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EXAMINER	
LUNDGREN, JEFFREY S	

ART UNIT	PAPER NUMBER
1639	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/583,920	SAILOR ET AL.	
	Examiner	Art Unit	
	Jeffrey S. Lundgren	1639	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10 and 12-45* is/are pending in the application.

4a) Of the above claim(s) *1-10,12-33 and 44* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *34-43 and 45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Supplemental Office Action

This Supplemental Action is issued to correct an error in the Final Office Action issued on January 5, 2010. The Action of January 5, 2010, was erroneously was issued for claims 10, 12-18 and 44, which were withdrawn from consideration, instead of the elected invention of claims 34-43 and 45. Accordingly, the previous Final Action is vacated, and the following Supplemental Final Office Action is issued.

Applicants election of Group IIb (claims 34-43 and 45), in the Reply of September 30, 2009 is acknowledged.

Claims 1-10 and 12-45 are pending in the instant application; 1-10 and 12-33 and 44 are withdrawn; claims 34-43 and 45 are the subject of the Final Office Action below.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 34-39, 41-43 and 45 are anticipated by Trau:

Claims 34-39, 41-43 and 45, are rejected under 35 U.S.C. 102(b)/(e) as being anticipated by Trau *et al.*, U.S Patent No. 2003/0124564, published on July 3, 2003.

Claim 34 is directed towards an encoded micron-sized particle having a code from a library of codes embedded in its physical structure by refractive index changes between different regions of the particle.

Trau teaches highly functionalized, porous organosilica particles and methods of their synthesis are described that employ high amounts of functional silane such as 3-mercaptopropyl

trimethoxysilane. Silane particle diameters are controlled from less than 1 micron to over 100 micron. The particles have a high surface area due to their advantageous internal structures, which consist of large pores, typically up to 10 m that are linked by small channels of typically about 20 nm diameter. Trau states:

> "In a preferred embodiment, ***multiple***, for example, six, different types of ***particles are made, each having a different thickness of optic coating***. During use, the six types are distinguished on the basis of scattering signals, despite their having the same fluorescent inner regions. This technique is ***particularly desirable for use in combinatorial chemistry as it provides another factor for distinguishing particle types. The technique of using light scattering for distinguishing different particle types is facilitated by the high porosity of the particles***. In a preferred embodiment, ***the difference in refractive index, more specifically the refractive index profile (e.g. generated by the varying porosity within each particle), gives rise to a unique scattering signature from each particle***."

Trau, paragraph 0091 (emphasis added).

Also described on the particles are thin films that contribute to the porosity variation and allow for the coding:

> "In a corresponding embodiment, different batches of particles are coated with ***different thicknesses of clear silicon shell, and the differing optic properties from the altered thicknesses are relied on to distinguish the particles***. For example, a first group of 0.5 micron average diameter particles are coated with 0.1 micron shell (0.7 micron final diameter), and a second group of 0.5 micron average diameter particles are coated with 0.3 micron shell (1.1 micron final diameter). The first group of particles are optically distinguished from the second group of particles by their different light scattering properties. The second group will more readily scatter 1 micron wavelength light than the first group. Both types are flowed through an imaging flow cell and optic imaging signals are produced that distinguish the different particle types based on their different scattering characteristics.
>
> The scattering properties of the particles can also be altered by incorporation of other materials into the particles either during synthesis (e.g., by incorporating titanium isopropoxide or similar reagent with the silane monomer) or post synthesis. These materials could include Ti and Al to alter the scattering and Fe to give the particles magnetic properties.

> In a preferred embodiment, multiple, for example, six, different types of particles are made, ***each having a different thickness of optic coating***. During use, the six types are distinguished on the basis of scattering signals, despite their having the same fluorescent inner regions. This technique is particularly desirable for use in combinatorial chemistry as it provides another factor for distinguishing particle types. The technique of using light scattering for distinguishing different particle types is facilitated by the high porosity of the particles. In a preferred embodiment, the difference in refractive index, more specifically the refractive index profile (e.g. generated by the varying porosity within each particle), gives rise to a unique scattering signature from each particle."

Trau, paragraphs 0089-0091 (emphasis added).

As in claims 35 and 36, Trau teaches refractive index changes and varyihng porosity and varying thickness (see captioned sections above). As in claims 37-39, Trau teaches and antibody (see paragraph 0029). As in claim 41, Trau teaches flourescent tags (see captioned portions above). As in claim 42, Trau teaches silicon particles (paragraphs 0008 and 0013).

As in claims 43 and 45, the particles and library of particles having the encoded porosity variation, meet the limitations of the instant claims (see above).

Claims 34-39, 41-43 and 45 are anticipated by Chan:

Claims 34-39, 41-43 and 45, are rejected under 35 U.S.C. 102(e) as being anticipated by Chan *et al.*, U.S Patent No. 7,226,733, issued on June 5, 2007.

Chan teaches a biological sensor which includes: a porous semiconductor structure comprising a central layer interposed between upper and lower layers, each of the upper and lower layers including strata of alternating porosity; and one or more probes coupled to the porous semiconductor structure, the one or more probes binding to a target molecule, whereby a detectable change occurs in a refractive index of the biological sensor upon binding of the one or more probes to the target molecule. Methods of making the biological sensor and methods of using the same are disclosed, as is a detection device which includes such a biological sensor. For example, Chan states:

> "A structure as described above, containing a central layer (microcavity) between upper and lower layers (Bragg reflectors), forms a microcavity resonator. This microcavity resonator solves several problems of other biological sensors using a simple porous silicon substrate (i.e., without the

> Bragg reflectors), one such problem being the presence of a broad photoluminescent peak. The microcavity resonator affords greater sensitivity in sensing the presence of biological targets. By confining the luminescence generated in the central layer of the microcavity by two Bragg reflectors, the photoluminescence spectrum is composed of multiple sharp and narrow peaks with FWHM values of about 3 nm (Chan et al., Phys. Stat. Sol. A 182:541-546 (2000), which is hereby incorporated by reference in its entirety). Upon a refractive index change, the photoluminescent spikes shift, thereby generating a large, detectable differential signal."

Chan, col. 2, lines 52-67.

Accordingly, the claims are anticipated.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. § 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 34-43 and 45 are obvious over Trau and/or Chan in view of Ghadiri:

Claims 34-43 and 45 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Trau *et al.*, U.S Patent Appl. Publ. No. 2003/0124564, published on July 3, 2003, and/or Chan *et al.*, U.S Patent No. 7,226,733, issued on June 5, 2007, in view of Ghadhiri *et al.*, U.S. Patent No. 6,248,530, issued on June 19, 2001.

The limitations of claims 34-39, 41-43 and 45, and the applicable teaches of Trau and Chan, can be found in the rejections above, and are hereby incorporated by reference.

Although Trau and Chan teach the claimed particles, neither explicitly states that their disclosed particles could be used as a "gas" phase sensor system, or act as a "gas receptor".

Ghadhiri teaches that the measurement of the wavelength shifts in the reflectometric interference spectra of a porous semiconductor substrate such as silicon, make possible the highly sensitive detection, identification and quantification of small analyte molecules. The sensor of the subject invention is effective in detecting multiple layers of biomolecular interactions, termed "cascade sensing", including sensitive detection of small molecule recognition events that take place relatively far from the semiconductor surface, such as various gases adsorbed to the silicon surface.

One of ordinary skill in the art would have had a reasonable expectation of success in arriving at the invention as claimed because each of Trau, Chan and Ghadhiri are directed towards the use of porous semiconductor substrates/particles for optical-based sensing that relies on the use of refractive index variations to create a discernable signal upon a binding event. One of ordinary skill in the art would have recognized the advantages of using and the approach of Ghadhiri with the optically encoded particles of either Trau and/or Chan because of the applications for gas-based sensor. Therefore, the invention as a whole was *prima facie* obvious at the time it was invented.

Conclusions

No claim is allowable.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

If Applicants should amend the claims, a complete and responsive reply will clearly identify where support can be found in the disclosure for each amendment. Applicants should point to the page and line numbers of the application corresponding to each amendment, and provide any statements that might help to identify support for the claimed invention (*e.g.*, if the amendment is not supported *in ipsis verbis*, clarification on the record may be helpful). Should Applicants present new claims, Applicants should clearly identify where support can be found in the disclosure.

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Jeff Lundgren whose telephone number is (571) 272-5541. The Examiner can normally be reached from 7:00AM to 5:30 PM (Mon-Thu).

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Christopher Low, can be reached on 571-272-09510951. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Jeffrey S. Lundgren/
Primary Examiner, Art Unit 1639